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Sociodemographic determinants of access to breast cancer screening in Mexico: A review of national surveys

Determinantes sociodemográficos del acceso a la detección del cáncer de mama en México: una revisión de las encuestas nacionales

Agudelo Botero, *Marcela*[1]

[1]*Health Care Administrator. Master's Degree in Demography. PhD in Population Studies. Researcher in Medical Sciences. Centro de Información para Decisiones en Salud Pública, Instituto Nacional de Salud Pública. Mexico.*
marcela.agudelo@insp.mx

ABSTRACT The aim of this article is to identify factors affecting access to breast cancer screening in Mexico according to the sociodemographic characteristics of the women, using three nationally-representative surveys. Descriptive statistics were performed and *multiple classification analysis* techniques were used. The dependent variables were that the women had realized: 1) breast self-examination, 2) clinical breast examination, or 3) mammography; the covariates were: age group, education level, type of locality (urban/rural), marital status, number of children, enrollment in social security and socioeconomic status. A low level of screening use was detected and gaps were observed between different groups of women according to sociodemographic characteristics. In general women of lower economic strata, without enrollment in social security and with lower educational levels, showed fewer detection practices than the national average.
KEY WORDS Breast Cancer; Health Inequalities; Early Detection of Cancer; Demography; Mexico.

RESUMEN El objetivo de este artículo es identificar los factores que explican el acceso a la detección del cáncer de mama en México en función de las características sociodemográficas de las mujeres, de acuerdo con tres encuestas representativas en el ámbito nacional. Se realizaron estadísticas descriptivas y se emplearon técnicas de *análisis de clasificación múltiple*. Las variables dependientes fueron que las mujeres se hubieran realizado: 1) la autoexploración, 2) el examen clínico de mamas, o 3) la mamografía; las covariables fueron: grupos de edad, escolaridad, tipo de localidad (urbana/rural), estado conyugal, número de hijos, derechohabiencia y estrato socioeconómico. Se encontró una cobertura de detección baja y se observaron brechas entre distintos grupos femeninos según las características sociodemográficas. Por lo general, las mujeres de estratos económicos más bajos, sin derechohabiencia y con menores niveles educativos, registraron prácticas de detección inferiores a la media nacional.
PALABRAS CLAVES Cáncer de Mama; Desigualdades en la Salud; Diagnóstico Precoz del Cáncer; Demografía; México.

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INTRODUCTION

Breast cancer is at present a public health issue demanding priority attention (1), as the disease is the leading cause of death due to malignant neoplasms in the female population worldwide (2,3). Although its incidence is greater in developed countries, the mortality rate is higher in countries with middle and low incomes such as Mexico (4), where between the years 1980 and 2009 the standardized mortality rate due to this cause increased by 45.3%, from 11.7 to 17 deaths per 100 thousand women aged 25 years and over (5). Estimates for the year 2010 for the female population of Mexico aged between 20 and 84 years have evidenced an average loss of 6.8 years of life, 2.8% of which is owing to breast cancer deaths (6).

Despite the significant progress in the study of breast cancer etiology, prevention and treatment as well as the expansion in health services coverage, great disparities in access and medical attention for this disease still persist in the country, which has led to late detection, a reduction in the survival rate, and, frequently, death (7-9). Evidence shows that breast cancer control to a large extent depends on sociodemographic, cultural, and economic factors as well as those related to the organization of health care services (10-14); however, little is known about the weight of the different variables in the detection of this illness.

Early detection is probably the most important link within the healthcare chain, for if the detection is timely, there is high probability that women can prolong their lives, so long as they carry out the subsequent intervention processes. Similarly, it has also been stated that certain socioeconomic characteristics of women as well as their geographical location put them at greater risk of dying from this type of cancer, due to the fact that, among other things, it is not timely detected (15).

Prognoses are not favorable and it is expected that both morbidity and mortality will continue to increase unless a comprehensive network of care for this type of cancer becomes available (16). It is therefore necessary to understand the complexity of the situation in order to implement measures that could avoid or reduce health inequities in the Mexican territory. The objective of this study is to identify the factors that explain access to breast cancer screening in Mexico in terms of the sociodemographic characteristics of women.

MATERIALS AND METHODS

This article is based on data from the National Health Survey (ENSA) [*Encuesta Nacional de Salud*] (17), the National Reproductive Health Survey (ENSAR) [*Encuesta Nacional de Salud Reproductiva*] (18) and the National Health and Nutrition Survey (ENSANUT) [*Encuesta Nacional de Salud y Nutrición*] (19), which were selected because they are representative at the national level and they contain information on access to breast cancer screening (Table 1).

Firstly, a statistical description was carried out considering women who had performed practices of breast cancer screening through self-examination, clinical examination or mammography, according to sociodemographic characteristics such as: age group, educational level, type of locality of residence, marital status, number of children, affiliation to social security and socioeconomic strata (20). Since the age ranges considered differed for each survey, age groups were formed that enabled the coverage of each screening technique to be analyzed according to the Norma Oficial Mexicana NOM-041-SSA2-2011 *Para la prevención, diagnóstico, tratamiento, control y vigilancia epidemiológica del cáncer de mama* [Mexican Official Standard for the prevention, diagnosis, treatment, control and epidemiological surveillance of breast cancer], where it is established that a) all women aged 20 years or over should perform a breast self-examination monthly, b) women over 25 years should have a clinical breast examination every year, and c) apparently healthy women aged 40 to 69 years should get a mammography once every two years. Women aged 70 years or over with a previous history of breast cancer should get a mammography as part of their follow-up process and on their doctor's advice (21).

Next, models of *multiple classification analysis* were adjusted (22,23), which helped determine the level of prediction of the incorporated factors and those that better explain women's

Table 1. Relevant characteristics of the analyzed surveys. Mexico, 2000, 2003, and 2006.

Characteristics	Surveys		
	ENSA (2000)	**ENSAR (2003)**	**ENSANUT (2006)**
Objectives	To contribute to the knowledge and identification of genetic, environmental, socioeconomic, cultural and lifestyle factors associated with health and the illnesses studied […] To contribute to the evaluation of particular health care programs (for example: vaccination, detection of cervical cancer and others)."	"To obtain information on Mexican women's reproductive health as well as on the knowledge and practice of related prevention and care measures, in order to evaluate the actions carried out and gain elements with which to better orient programs."	To estimate frequency and distribution of positive health indicators, disease risk factors, nutritional states and nutritional deficiencies, diseases (acute and chronic), injuries and disabilities at national, regional, urban and rural levels, and for each of the federal states of Mexico."
Geographic coverage	National	National (urban and rural). States (urban/rural): Chiapas, Guerrrero, Oaxaca, Guanajuato, Puebla, San Luís Potosí, Sonora, Tamaulpas	National and urban and rural areas of each of the 32 states and from all the country
Sample design	Probabilistic, multi-stage, stratified and cluster samplings	Probabilistic multi-stage and stratified samplings	Probabilistic, multi-stage, stratified and cluster samplings
Age range of women in sample	20 years and over	15 to 49 years	20 years and over
Detection techniques	Clinical breast examination	Self-examination, clinical breast examination	Mammography
Total questions on breast cancer	7	17	12

Source: Own elaboration based on the ENSA (17), the ENSAR (18) and the ENSANUT (19).

ENSA= National Health Survey [*Encuesta Nacional de Salud*], ENSAR= National Reproductive Health Survey [*Encuesta Nacional de Salud Reproductiva*], ENSANUT= National Health and Nutrition Survey [*Encuesta Nacional de Salud y Nutrición*].

breast cancer screening practices. In the *multiple classification analysis* different predictive variables are related to only one dependent variable in an attempt to explain its variance. These models show the "net" influence of each of the predictive variables before and after the adjustment for other covariables incorporated in the analysis in order to counteract the effect of the correlations between independent variables. This process aims to identify what remains of the original relationship between the independent and the dependent variables after having deducted the part that is actually caused by other correlated variables (23). This analysis helps determine the strength of the relationship between each of the predictive variables and the dependent variable, as well as the part of this relationship that remains when the other variables are taken into account (22).

The assumptions of the *multiple classification analysis* are similar to those used in multiple regression models but in this case, instead of using summary statistics of all the variables, all the categories of a predictive variable are considered, as if each category were an independent variable and uncorrelated to the remaining explanatory variables. This is an appropriate methodology to apply when a great deal of data is available, as is the case with population-wide surveys (23).

The dependent variables were: 1) that the woman had performed breast self-examination, or 2) that the woman had had a clinical breast examination, or 3) that the woman had had a mammography. The covariables were the sociodemographic variables mentioned above. Results of the models of multiple classification analysis illustrate the following information:

- Predicted median: it refers to the effect of each category (adjusted and unadjusted); that is to say, the unadjusted value is the net effect of the category without the intervention of the other

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variables included in the analysis, whereas the adjusted index shows the effect of the category in the presence of the others considered in this study. This value shows how certain characteristics of women affect the access to practices like self-examination, clinical examination or mammography.

- Deviation: helps compare the direction of the variable's effect (including its categories) with respect to the overall median. The deviation values may be positive or negative and show the groups of women that are above and below the national average in the access to breast cancer screening. This indicator helps determine which women have greater or fewer barriers to the detection of the disease.
- η and β: they account for the explained proportion of each variable, unadjusted and adjusted, respectively. Both measures can be used to determine which sociodemographic variables explain to a greater or lesser extent the access to breast cancer screening.

Data were processed through the Statistical Package for the Social Sciences (SPSS), version 19.0.

RESULTS

Practices of breast cancer screening

In Mexico, a varied coverage of breast cancer screening through breast self-examination, clinical breast examination or mammography was found. These variations were related to the way questions were presented, to the time period when the information was gathered and to the age groups of the women, all of which were defined according to the objectives of each survey.

According to the ENSAR, 77.2% of interviewees aged 20 to 49 years performed breast self-examination and 47.5% of women aged 25 to 49 years had clinical breast examination. The ENSA reported 11.2% coverage of clinical breast examination in women aged 25 years or older. Finally, the ENSANUT showed that 21.2% of women aged 40-69 years had a mammography performed in the 12 months prior to the survey. This percentage decreased to 19.2% in the case of women aged 50 years and over.

According to the sociodemographic characteristics of women, there were different degrees of access to breast cancer screening techniques. In the ENSA, the percentage of women from urban areas, affiliated to social security, of medium to high socioeconomic strata, without partners, with or without children, with a high school degree or higher education and aged between 30 and 59 years who had had a clinical breast exam was above the general average. According to the ENSAR, the greatest differences were related to affiliation to social security and socioeconomic strata; that is to say, women with affiliation to social security and from medium to high socioeconomic strata showed a greater percentage of coverage of breast self-examination and of clinical breast examination than those women without affiliation to social security and belonging to very low to low socioeconomic strata. Regarding breast self-examination, remarkable variations depending on the type of locality were also found, with the percentage of use of the technique being much lower among women from rural areas. As regards mammography, the ENSANUT evidenced that gaps among groups with different sociodemographic characteristics still prevail, with more pronounced differences owing to affiliation to social security, educational level, number of children and socioeconomic strata. Similarly, it was observed that women aged 50 to 59 years performed more mammographies than women from other age groups (Table 1).

Variables associated with access to breast cancer screening

According to the ENSAR, the sociodemographic variables which together explained to the greatest degree breast self-examination were educational level, age group and type of locality. Both the variables of marital status and number of children were not statistically significant in the model. Women from urban areas, without children, from medium-high socioeconomic strata, with a high school degree or above, affiliated to social security and aged between 30 and 49 years had adjusted medians which exceeded the overall median (0.77). This means that these women had greater access to breast cancer screening through

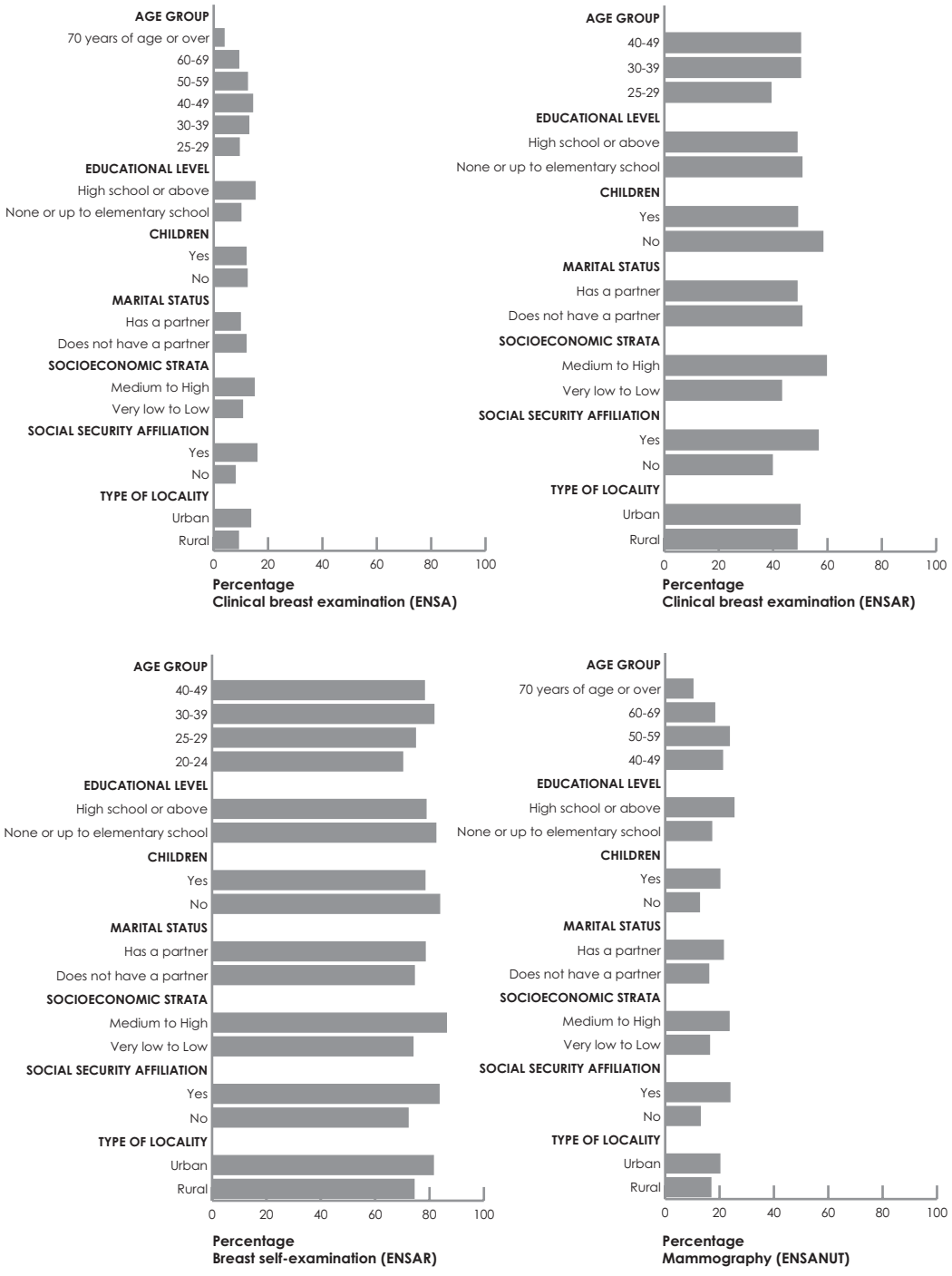

Figure 1. Percentage distribution of breast cancer screening techniques applied, according to women's sociodemographic characteristics and type of survey. Mexico, 2000, 2003 and 2006.

Source: Own elaboration based on the ENSA (17), the ENSAR (18) and the ENSANUT (19).
ENSA= National Health Survey [*Encuesta Nacional de Salud*],
ENSAR= National Reproductive Health Survey [*Encuesta Nacional de Salud Reproductiva*],
ENSANUT= National Health and Nutrition Survey [*Encuesta Nacional de Salud y Nutrición*].

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breast self-examination than the average of interviewed women. Negative effects (at the other extreme of the overall median) were detected in women from rural areas, without partners, from very low to low socioeconomic strata, with no education or only elementary education, not affiliated to social security and aged between 20 and 29 years (Table 2).

The weight of variables with respect to clinical breast examination was different between the ENSA and the ENSAR. In the first survey, locality and marital status were the most significant variables (adjusted median), considering all analyzed variables. In the ENSAR, affiliation to social security and socioeconomic strata explained to the greatest extent the access to clinical examination. In both models it was discovered that at the individual level (η), both educational level and socioeconomic status largely influence the use of this screening technique. The results of both surveys show that women from urban localities, with medium to high socioeconomic status,

Table 2. Results of multiple classification analysis of breast self-examination, according to sociodemographic variables (N=11,800). National Reproductive Health Survey [*Encuesta Nacional de Salud Reproductiva*], Mexico, 2003.

Variable	Category	n	Predicted median		Deviation		η	β	Significance
			Unadjusted	Adjusted	Unadjusted	Adjusted			
Locality	Rural	2,984	0.67	0.72	-0.11	-0.05	0.15	0.07	***
	Urban	8,816	0.81	0.79	0.04	0.02			
Marital status	Has partner	1,709	0.77	0.76	0.00	-0.01	0.00	0.01	NS
	Does not have partner	10,091	0.77	0.77	0.00	0.00			
Socioeconomic strata	Very low to Low	9,211	0.74	0.76	-0.03	-0.01	0.14	0.03	***
	Medium to High	2,589	0.88	0.80	0.11	0.03			
Educational level	None or up to elementary school	5,683	0.69	0.71	-0.08	-0.06	0.18	0.14	***
	High school or above	6,117	0.85	0.83	0.07	0.06			
Affiliation to social security	No	7,132	0.72	0.75	-0.05	-0.03	0.16	0.08	***
	Yes	4,668	0.85	0.81	0.08	0.04			
Age group	20-24	1,618	0.69	0.69	-0.08	-0.08	0.11	0.10	***
	25-29	2,232	0.72	0.73	-0.05	-0.05			
	30-39	4,656	0.81	0.80	0.03	0.03			
	40-49	3,294	0.80	0.80	0.03	0.03			
Children	No	194	0.81	0.80	0.04	0.03	0.01	0.01	NS
	Yes	11,606	0.77	0.77	0.00	0.00			

Source: Own elaboration based on the National Reproductive Health Survey (18).

η = Explained proportion of each variable (unadjusted). β = Explained proportion of each variable (adjusted).
*** Significance level (p<0.001)
NS = Not significant.

Table 3. Results from the multiple classification analysis of clinical breast examination, according to sociodemographic variables (N=21,338). National Health Survey [*Encuesta Nacional de Salud*], Mexico, 2000.

Variable	Category	n	Predicted median		Deviation		η	β	Significance
			Unadjusted	Adjusted	Unadjusted	Adjusted			
Locality	Rural	10,025	0.10	0.12	-0.02	-0.01	0.68	0.23	***
	Urban	11,363	0.15	0.13	0.02	0.01			
Marital status	Has partner	17,091	0.13	0.13	0.01	0.00	0.34	0.20	***
	Does not have partner	4,297	0.10	0.11	-0.02	-0.01			
Socioeconomic strata	Very low to low	17,032	0.12	0.12	-0.01	0.00	0.56	0.01	***
	Medium to high	4,356	0.16	0.13	0.04	0.01			
Educational level	None or up to elementary school	13,338	0.10	0.11	-0.02	-0.01	0.85	0.05	***
	High school or above	8,050	0.16	0.15	0.04	0.02			
Affiliation to social security	No	11,550	0.09	0.09	-0.04	-0.03	0.12	0.10	***
	Yes	9,838	0.17	0.16	0.04	0.04			
Age group	25-29	3,764	0.10	0.10	-0.02	-0.02	0.07	0.08	***
	30-39	7,227	0.13	0.13	0.01	0.01			
	40-49	5,079	0.15	0.15	0.02	0.03			
	50-59	2,709	0.14	0.14	0.01	0.01			
	60-69	1,608	0.11	0.10	-0.02	-0.03			
	70 o más	1,001	0.05	0.04	-0.08	-0.08			
Children	No	187	0.13	0.13	0.01	0.01	0.00	0.00	NS
	Yes	21,201	0.12	0.12	0.00	0.00			

Source: Own elaboration based on the National Health Survey (17).

η = Explained proportion of each variable (unadjusted). β = Explained proportion of each variable (adjusted).
*** Significance level ($p<0.001$)
NS = Not significant.

with a high education level, affiliated to social security (public or private) and aged 30 years or older have increased probabilities of having the exam performed ($p<0.001$). Furthermore, other characteristics such as coming from rural areas, having a low socioeconomic status, having no education or having only elementary education, not being affiliated to social security, aged between 20 to 29, 60 to 69 or 70 or more years; and having a partner (only in the ENSA) reduce the probabilities of using clinical breast examination as a breast cancer screening technique (Table 3 and Table 4).

In the ENSANUT, all sociodemographic variables considered were statistically associated with access to mammography ($p<0.001$), although those variables which explained the access to mammography to the greatest degree were the variables of affiliation to social security and age group (both individually and collectively). Socioeconomic stratum was also significant. Women

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Table 4. Results of the multiple classification analysis of clinical breast examination, according to sociodemographic variables (N=10,182). National Reproductive Health Survey [*Encuesta Nacional de Salud Reproductiva*], Mexico, 2003.

Variable	Category	n	Predicted median		Deviation		η	β	Significance
			Unadjusted	Adjusted	Adjusted	Adjusted			
Locality	Rural	2,512	0.37	0.44	-0.10	-0.02	0.11	0.03	***
	Urban	7,670	0.49	0.47	0.03	0.01			
Marital status	Has partner	1,452	0.45	0.44	-0.01	-0.03	0.01	0.02	NS
	Does not have partner	8,730	0.47	0.47	0.00	0.00			
Socioeconomic stratas	Very low to low	7,733	0.42	0.45	-0.04	-0.01	0.15	0.05	***
	Medium to high	2,449	0.60	0.51	0.13	0.05			
Educational level	None or up to elementary school	5,020	0.38	0.41	-0.08	-0.05	0.17	0.10	***
	High school or above	5,162	0.55	0.51	0.08	0.05			
Affiliation to social security	No	6,011	0.38	0.41	-0.08	-0.06	0.20	0.14	***
	Yes	4,171	0.58	0.55	0.12	0.08			
Age group	25-29	2,232	0.40	0.41	-0.06	-0.06	0.07	0.06	***
	30-39	4,655	0.48	0.47	0.01	0.01			
	40-49	3,295	0.49	0.49	0.03	0.03			
Children	No	108	0.56	0.51	0.09	0.05	0.02	0.01	NS
	Yes	10,074	0.46	0.46	0.00	0.00			

Source: Own elaboration based on the National Reproductive Health Survey (18).

η = Explained proportion of each variable (unadjusted). β = Explained proportion of each variable (adjusted).
*** Significance level (p<0.001)
NS = Not significant.

without partners, without children, from medium to high socioeconomic strata, with an educational level of high school or above, affiliated to social security, and those aged 60 years or more exceeded the average level (1.81) of mammography coverage, unlike women with partners and children, in the low socioeconomic strata, with no education or only elementary education, not affiliated to social security and between 40 and 59 years of age (Table 5).

DISCUSSION

Mexico lacks a universal record of women with breast cancer and little is known about the care processes of this disease, from screening to treatment and control (24,25). However, it is possible to explore the screening practices of this disease through data gathered in population surveys. These surveys have the advantage of including both women who use or have access to health services and those who,

for a number of circumstances, do not have access to these services. In this study, the lack of solid and consistent data to measure this phenomenon was evidenced, as has been previously confirmed by other authors (1,26).

The issue of breast cancer screening practices has been addressed in a marginal way through different surveys conducted in the country without there yet being standardized criteria of data collection allowing for a direct comparison of the results over time. Proof of this may be seen in the values calculated by the ENSA (2000) and the ENSAR (2003) in which breast examination by medical staff was investigated. By analyzing the way the questions about this technique were formulated, we can attempt to explain the variations in the coverage percentages obtained. In the first survey, the question was: During the last months, have you visited the preventive medicine unit for breast cancer screening? (clinical examination) (17), while in the ENSAR the question was: Has a physician or health care provider examined your breasts to see if you have any tumors or lumps? (18). Therefore, the design of the questionnaire could have influenced the interviewees' answers, considering as well that each survey had

Table 5. Results from the multiple classification analysis of mammography, according to sociodemographic variables (N=12,281). National Health and Nutrition Survey [*Encuesta Nacional de Salud y Nutrición*], Mexico, 2006.

Variable	Category	n	Predicted median		Deviation		η	β	Significance
			Unadjusted	Adjusted	Unadjusted	Adjusted			
Locality	Rural	3,169	1.80	1.81	-0.01	0.00	0.04	0.01	***
	Urban	9,112	1.83	1.80	0.03	0.00			
Marital status	Has partner	4,829	1.84	1.82	0.03	0.01	0.07	0.03	***
	Does not have partner	7,452	1.79	1.80	-0.02	-0.01			
Socioeconomic strata	Very low to low	7,176	1.77	1.78	-0.04	-0.03	0.09	0.06	***
	Medium to high	5,105	1.84	1.83	0.03	0.02			
Educational level	None or up to elementary school	9,065	1.75	1.78	-0.06	-0.03	0.09	0.04	***
	High school or above	3,216	1.83	1.82	0.02	0.01			
Affiliation to social security	No	5,100	1.76	1.77	-0.05	-0.04	0.14	0.12	***
	Yes	7,181	1.87	1.86	0.06	0.05			
Age group	40-49	4,971	1.79	1.80	-0.02	-0.01	0.11	0.09	***
	50-59	2,962	1.76	1.77	-0.04	-0.04			
	60-69	2,173	1.82	1.81	0.01	0.01			
	70 o más	2,175	1.90	1.88	0.09	0.07			
Children	No	1,356	1.87	1.86	0.07	0.05	0.06	0.05	***
	Yes	10,925	1.80	1.80	-0.01	-0.01			

Source: Own elaboration based on the National Health Survey (17).

η = Explained proportion of each variable (unadjusted). β = Explained proportion of each variable (adjusted).
*** Significance level (p<0.001)

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populations of reference which differed from each other (see Table 1).

Despite these limitations related to methodological issues, this article shows the main sociodemographic variables associated with the access to the different breast cancer screening techniques (self-examination, clinical examination and mammography), according to data from three surveys of national purview – ENSA (2000), ENSAR (2003) and ENSANUT (2006) (17-19) – that evidenced deep inequalities in the screening of this disease, which specially affects the poorest women of the country (5,6,27-29). Furthermore, it was found that breast cancer screening coverage through different techniques is insufficient considering the NOM-041-SSA2-2011 which indicates that women, according to age group, should be the object of preventive actions either individually or with the support of health care providers (21).

Overall, it was observed that certain sociodemographic conditions, such as not being affiliated to social security, belonging to the low socioeconomic strata, having no or little education, and coming from rural areas, represent a great disadvantage for women to access or utilize health services for breast cancer screening. However, it cannot be affirmed that only these women have barriers to screening; regarding breast cancer, the situation is complicated in all aspects and for all the groups involved. In this sense, we suggest research be carried out which could help determine the obstacles in each community, state or region, considering the individual and contextual variables surrounding them.

In addition to extending the screening coverage through mammography, especially in women aged 50 to 69 years, and reinforcing the practice of breast self-examination in women aged 20 and over and of clinical breast examination in the female population aged 25 years or older, it is essential to guarantee that such techniques be performed with the quality necessary to achieve early detection of the disease. Therefore, is essential that health staff undergo constant training and that clear and standardized messages be conveyed to all women in order to influence their attitudes and behaviors (30,31). At the same time, a comprehensive care network including human, physical and financial resources should be available to effectively complete the other phases of diagnosis, treatment and control of this disease (32,33).

Although a reduction of mortality through breast self-examination and clinical examination has not yet been demonstrated, these techniques may contribute to the early detection of the signs and symptoms that lead to breast cancer (15,34); thus, these interventions should be carried out within a framework of respect to women's privacy and their ideological, cultural and religious beliefs (35). It is also necessary to implement strategies aimed at improving the population's living conditions, such as women's formal education, changes in lifestyles which are harmful to health, and the development of physical infrastructure to remove barriers of access to and use of health services at all levels of care.

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